

# Michigan Wind Energy Transmission Study (MI-WETS)



October 28, 2008 Update

for Michigan Planning Consortium  
Generation Integration Workgroup

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# Outline of presentation...

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- ❑ Roll of Michigan Planning Consortium
- ❑ Impacts of PA 295 and  
“Wind Energy Resource Zones”
- ❑ MI WETS Overview
- ❑ MI WETS for Lower Peninsula Update
- ❑ MI WETS for Upper Peninsula Update
- ❑ Questions and Discussion

# MI Planning Consortium

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- ❑ In July 2008, MPSC Order in Case No. U-15590 established the Michigan Planning Consortium (MPC) to improve the planning process for electricity infrastructure projects and identify possible ways to reduce ratepayer costs.
- ❑ Initial MPC goals include:
  - Ensure adequate information sharing in the planning process, on a local and detailed level.
  - Evaluate energy infrastructure alternatives, including proposed transmission projects.
  - Examine cost effects of alternatives on Michigan customers.
  - Recommend most effective ways for Michigan stakeholders to participate in regional planning processes, and related state and Federal Energy Regulatory Commission (FERC) proceedings, including MPSC Act 30 certification proceedings (for a transmission line Certificate of Public Convenience and Necessity; CPCN).

# MI Planning Consortium (2)

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- ❑ “Generation Integration” group is focused on transmission planning for Michigan wind resource development and other generation integration, to identify ways to best coordinate and hopefully optimize transmission expansion in Michigan.
- ❑ MI Planning Consortium is presently one of 7 active MPSC Electricity Workgroups. Link to “workgroups” webpage by visiting <http://www.michigan.gov/mpsc>, then click on “**Electricity**” then “**Workgroups**”.
- ❑ MI-WETS report will be subsumed into MPC, but MPC goals are broader than MI-WETS.

# MI Wind Energy Resource Zones (1)

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- SB 213 (2008 PA 295) became law Oct 6. Part 4 is about new Michigan “Wind Energy Resource Zones”
- MPSC has 60 days to create the wind energy resource zone board, with 9 members: 1 representing the commission; 2 representing electric utility industry; 1 alternative electric suppliers; 1 the attorney general; 1 the renewable energy industry; 1 cities and villages; 1 townships; 1 independent transmission companies; 1 a statewide environmental organization; 1 the public at large.
- Invitation to apply for Board membership is on the MPSC home page now – [www.michigan.gov/mpsc](http://www.michigan.gov/mpsc). Applications due by email no later than Nov 7.

# MI Wind Energy Resource Zones (2)

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- ❑ The board shall...
  - Consult with local governments to study wind energy potential, commercial viability, and land use potential
  - Conduct modeling and studies of Michigan wind energy, including studying existing wind energy systems
- ❑ Board has 240 days (from date Act is passed) to issue a proposed report, including a list of regions in the state with the highest level of wind energy harvest potential and a description of the estimated maximum and minimum wind generating capacity (in MW) in megawatts and energy production potential (in MWh) that can be installed in each identified region of this state.

# MI Wind Energy Resource Zones (3)

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- ❑ Public comments and comments from local units of government within 63 days.
- ❑ Hearing on proposed report; optional hearings in each high-potential region.
- ❑ Within 45 days after public comment and hearings, the board shall issue a final report.
- ❑ The Board is dissolved 90 days after issuing the final report (about 15 months total, roughly to year end 2009).

# MI Wind Energy Resource Zones (4)

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- After the Board issues its final report, electric utilities, affiliated transmission companies and independent transmission companies with transmission facilities within or adjacent to regions identified in the report shall identify existing or new transmission infrastructure necessary to deliver maximum and minimum wind energy production potential for each of those regions and shall submit this information to the board for its review.



# MI Wind Energy Resource Zones (5)

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- Then, the MPSC shall, through a final order, designate a primary (and may designate additional) wind energy resource zone(s).
- For a designated zone, the MPSC may issue an expedited transmission line siting certificate
- MPSC annual reports, “summarizing the impact of establishing wind energy resource zones, expedited transmission line siting applications, estimates for future wind generation within wind zones, and recommendations for program enhancements or expansion,” to the governor and legislature on or before first Monday of March, each year.

# MI-WETS Overview

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- A preliminary, high-level scoping study, for information only
- NOT generation interconnection studies; NOT transmission system plans
- Separate studies performed for UP and LP
- Overall Goal: Model different possible scenarios for wind energy production in Michigan, to develop an overview and basic understanding of high level transmission system needs
- Objective: Provide basic information policy makers can use to begin to understand the likely ramifications of future wind energy development

# MI-WETS for Lower Peninsula

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- ❑ This study is **NOT** intended to:
  - Present solutions to all possible conditions that could lead to planning criteria violations
  - Identify system issues on the lower voltage sub-transmission or distribution systems
  - Identify system issues on other neighboring systems
  - Represent that any “engineering” feasibility has been determined for any proposed projects
  - Serve as an interconnection study for any specific future generator or groups of generators
  - Provide generation developers aid in siting future generation

# MI-WETS for Lower Peninsula

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- ❑ Several specific wind scenarios analyzed:
  - low, medium, and high on-shore wind production (1500 MW, 3000 MW, 4500 MW)
  - one off-shore scenario (adding two 500 MW off-shore farms to 4,500 MW scenario)
  - with and w/o three possible future fossil units
- ❑ Scenarios developed with input from MI-WETS Working Group
- ❑ This study does not include community wind or small wind systems, that will interconnect at distribution system voltages.

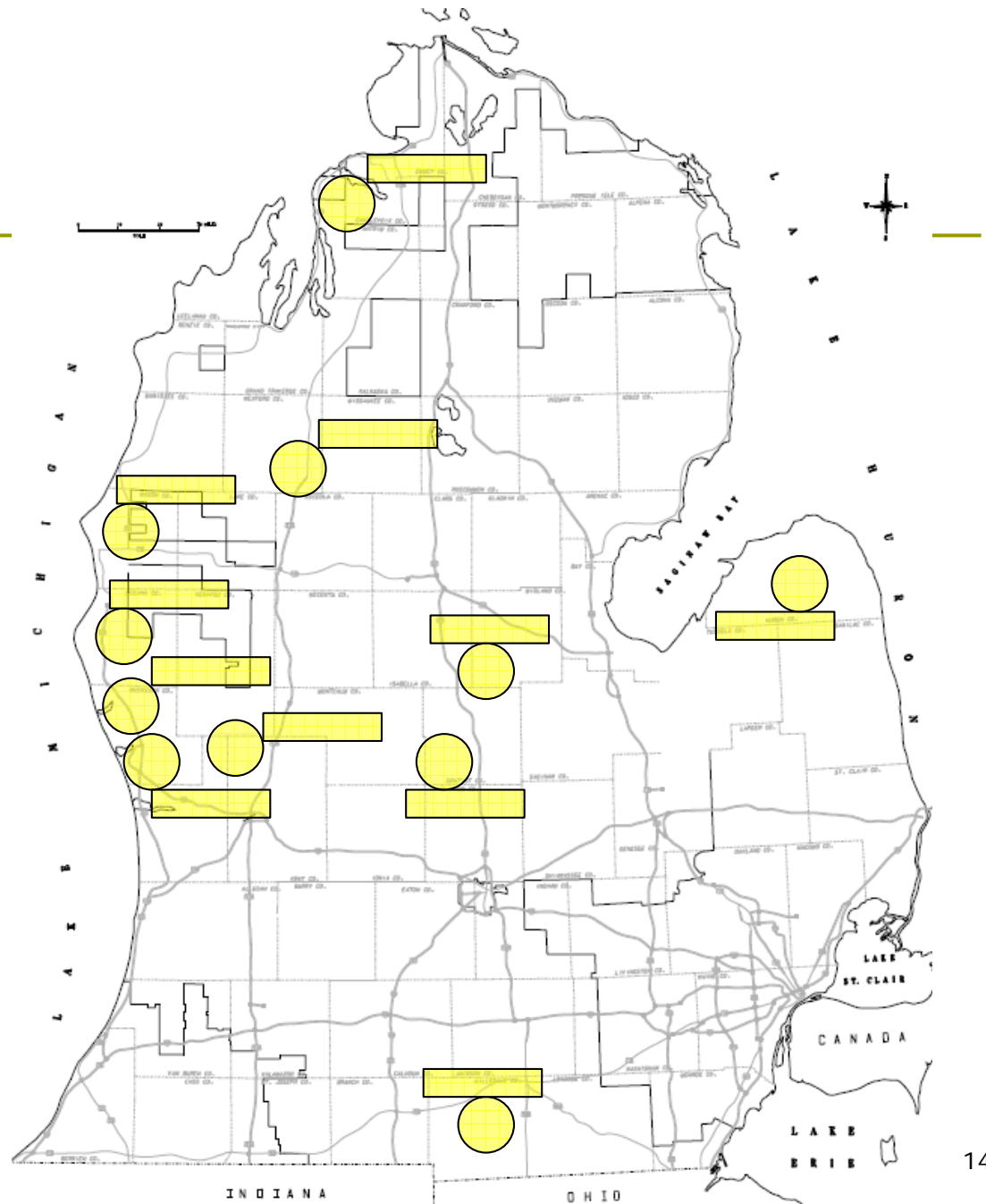
# Scaling Factor Assumptions

Base (No Scaling Factors)			Low (MW)	Medium (MW)	High (MW)
County/Area*	#MW in MISO Queue by County/Area	% of MW Wind Interconnection Requests in MISO Queue by County/Area (LP Only)	1,500	3,000	4,500
Charlevoix	120	4.8%	72	145	217
Mason	220	8.8%	133	265	398
Osceola	270	10.8%	163	325	488
Oceana	140	5.6%	84	169	253
Muskegon	100	4.0%	60	120	181
GR North	420	16.9%	253	506	759
Gratiot	300	12.0%	181	361	542
Midland	320	12.9%	193	386	578
Hillsdale	300	12.0%	181	361	542
Thumb	300	12.0%	181	361	542
<b>Totals</b>	<b>2,490</b>	<b>100%</b>	<b>1,500</b>	<b>3,000</b>	<b>4,500</b>

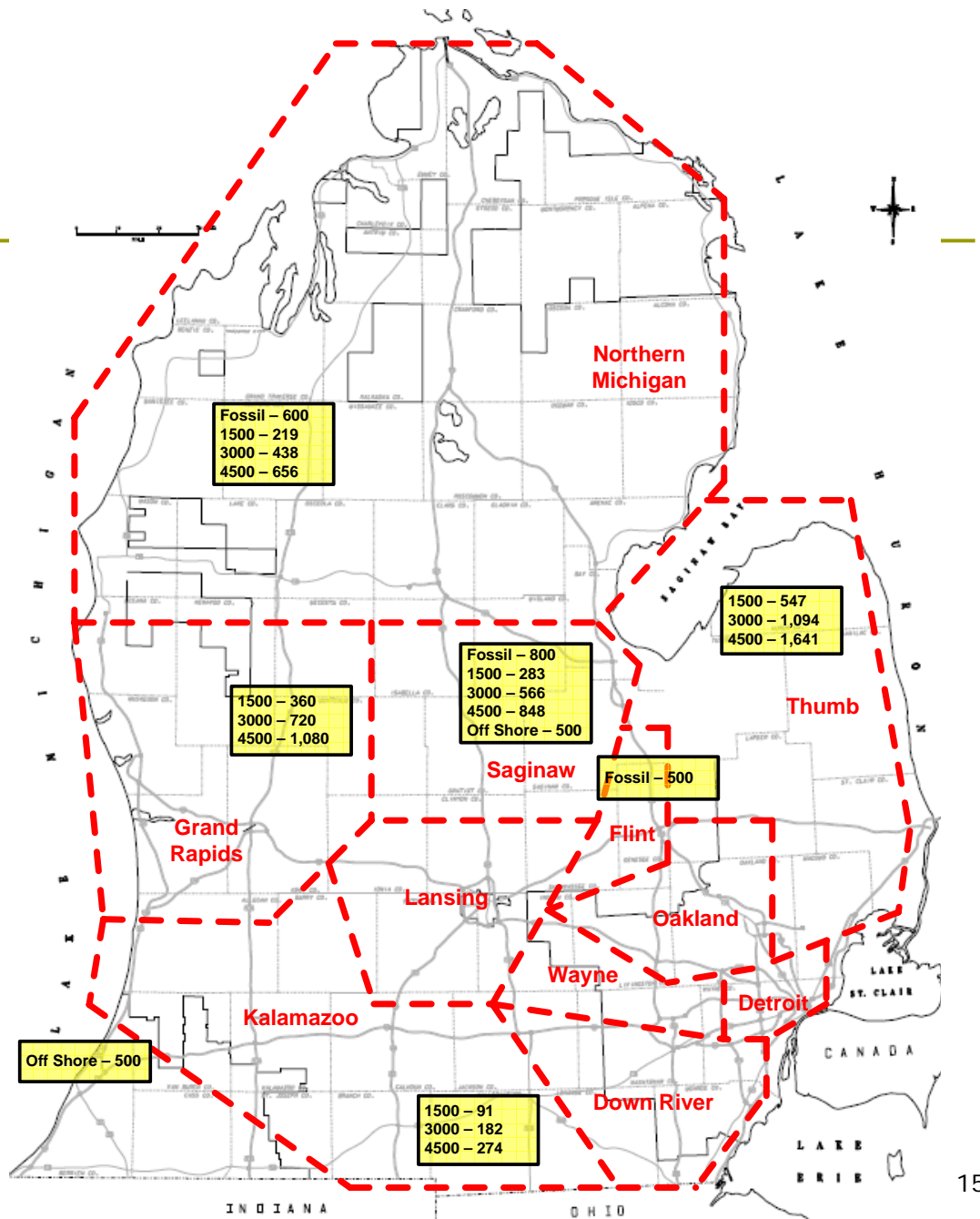
Alternative: Adjusted MW Amounts Using Proposed Scaling Factors			Low (MW)	Medium (MW)	High (MW)
County/Area*	MW by County/Area w/ Proposed Scaling Factors	% of MW by County/Area w/ Proposed Scaling Factors	1,500	3,000	4,500
Charlevoix	90	3.6%	55	109	164
Mason	165	6.7%	100	201	301
Osceola	202.5	8.2%	123	246	369
Oceana	105	4.3%	64	128	191
Muskegon	75	3.0%	46	91	137
GR North	315	12.8%	191	383	574
Gratiot	225	9.1%	137	274	410
Midland	240	9.7%	146	292	438
Hillsdale	150	6.1%	91	182	274
Thumb	900	36.5%	547	1094	1641
<b>Totals</b>	<b>2,468</b>	<b>100%</b>	<b>1,500</b>	<b>3,000</b>	<b>4,500</b>

- Some interconnection requests in the MISO queue were aggregated based points of interconnection rather than the county listing on MISO's website.
- The MI-WETS group devised the following scaling factors in order to better reflect what the group felt would be a realistic distribution of the wind:
  - Increase by a factor of 2.5 times the quantity of wind in the Thumb area.
  - Decrease by a factor of 0.75 the quantity of wind in Western Michigan (Osceola, Mason, Ottawa /Grand Rapids), Charlevoix County, and Gratiot County/Midland area.
  - Decrease by a factor of 0.5 the quantity of wind in Hillsdale County.

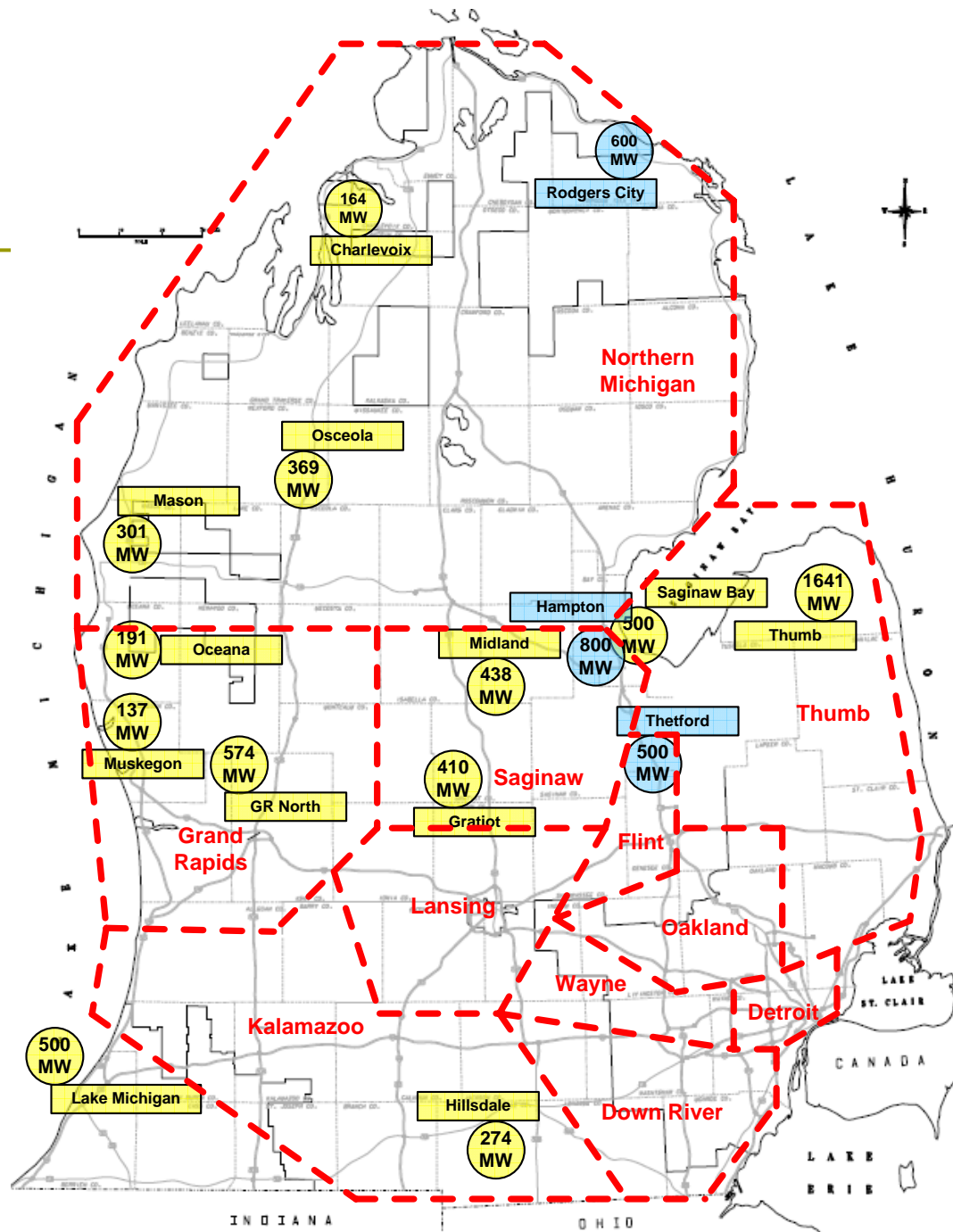
# MISO Queue Wind Generation Locations



# Future Generation Locations by Area

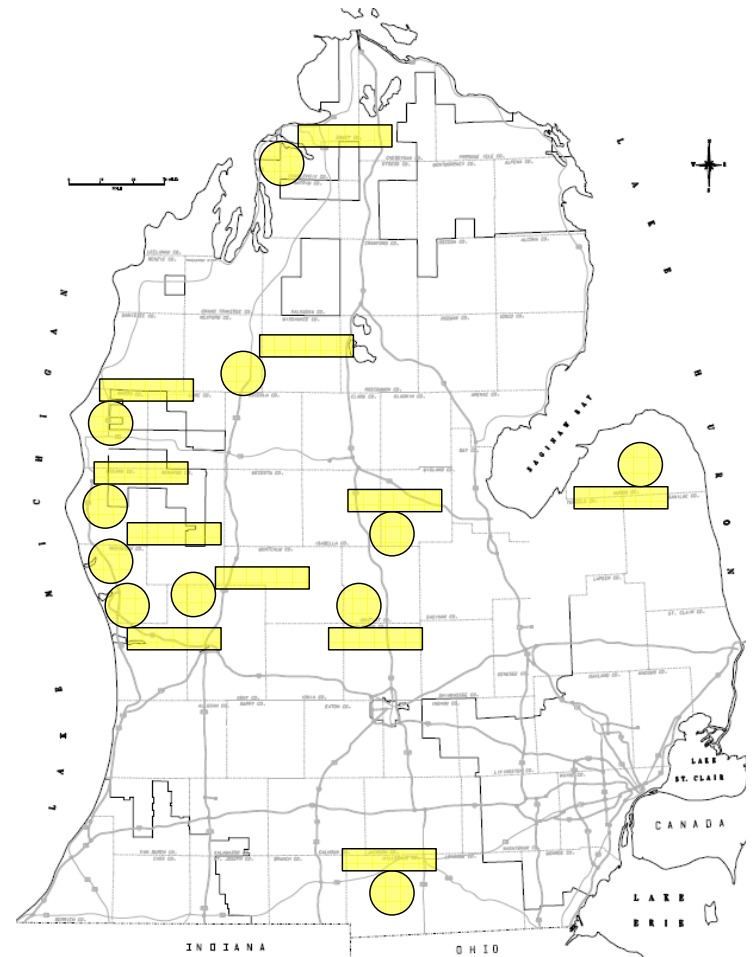
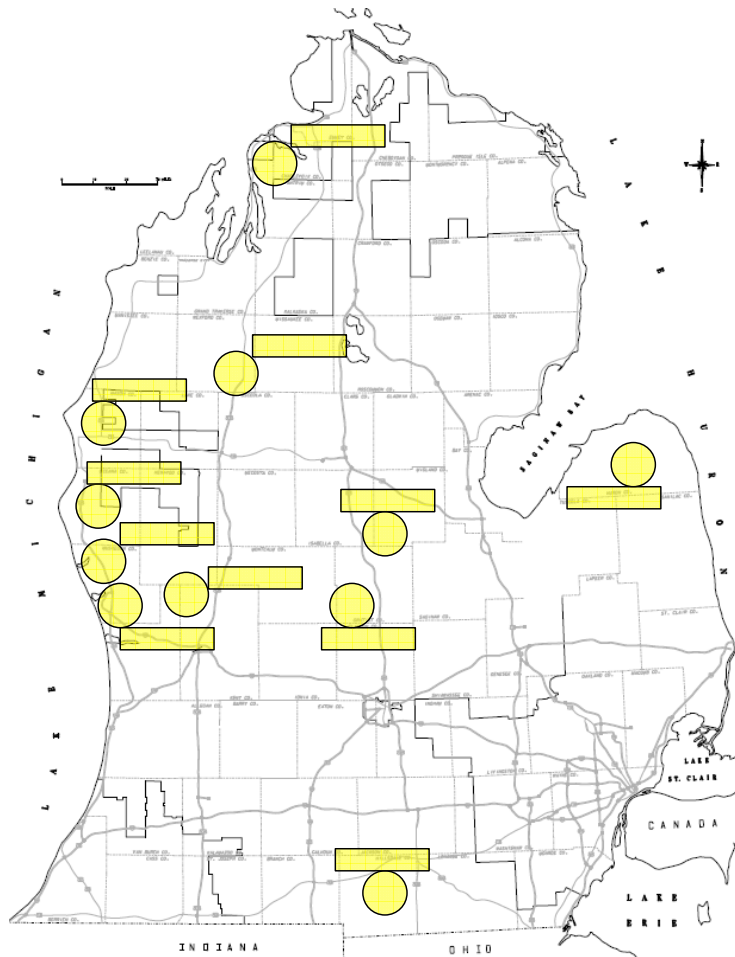


# Future Generation Locations by Site



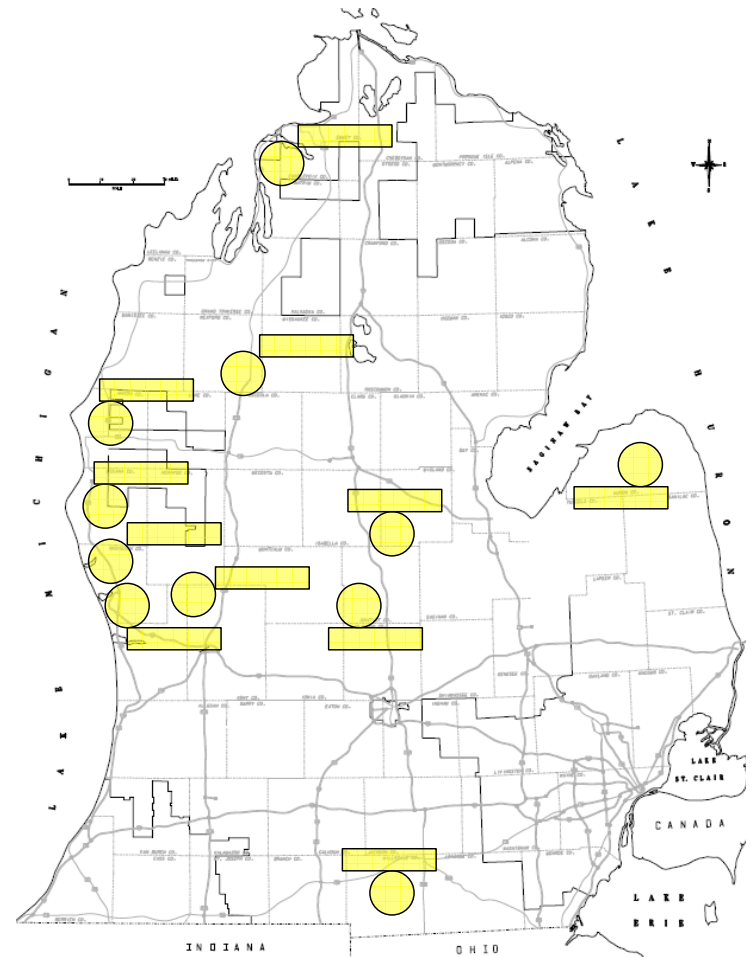
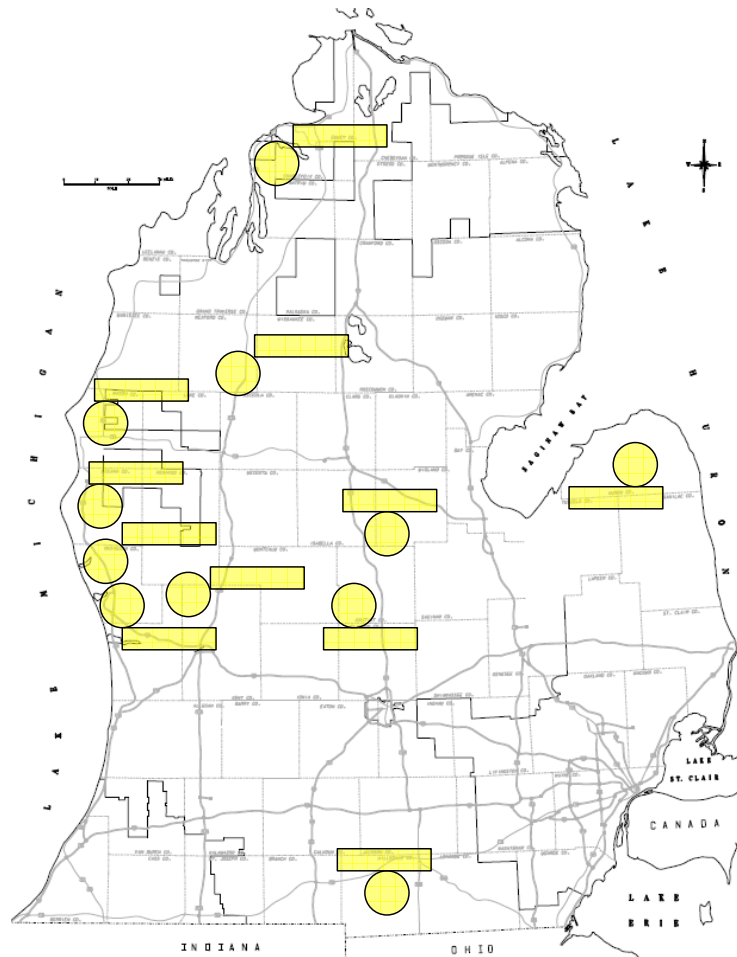


# Future Generation Locations



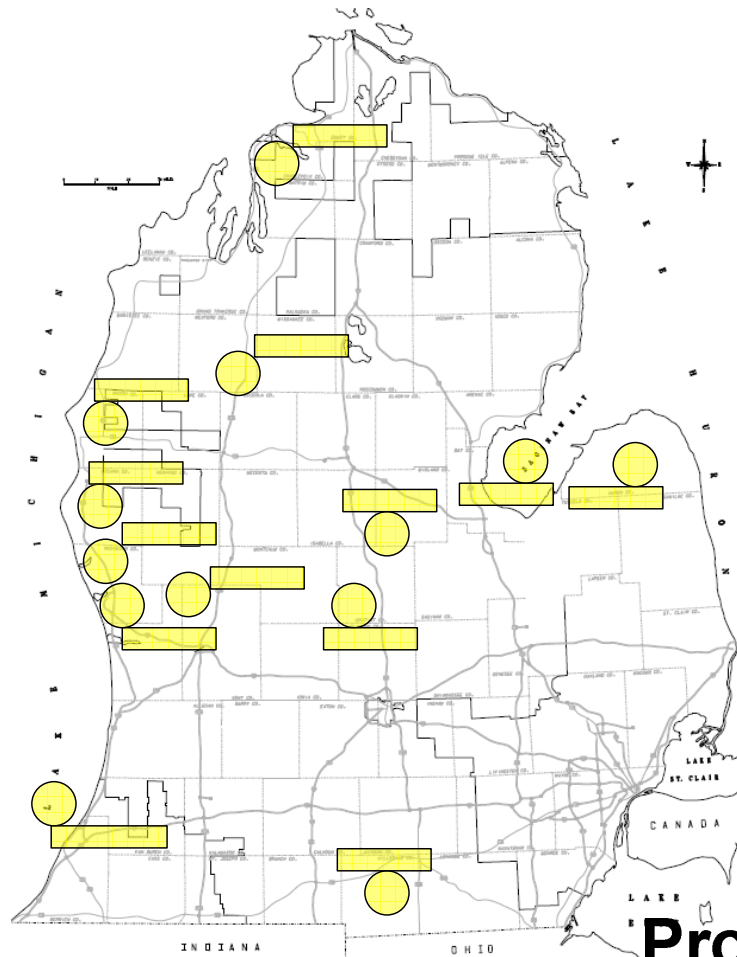
**Current MISO**

# Future Generation Locations

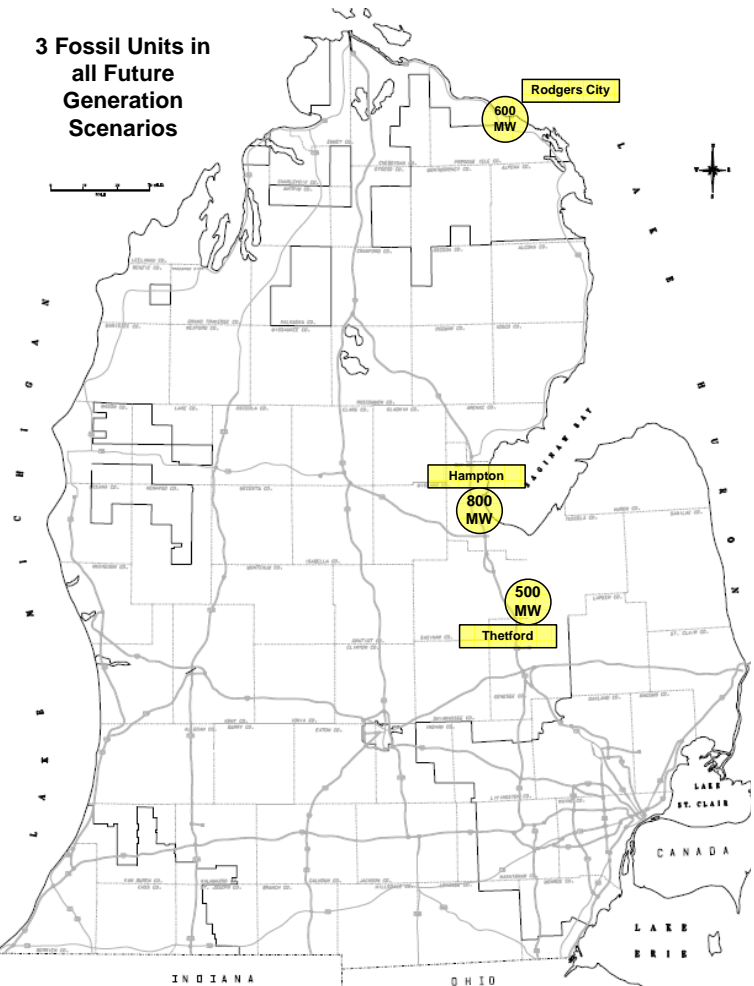


**Proposed Wind  
Farm Locations**

# Future Generation Locations



3 Fossil Units in  
all Future  
Generation  
Scenarios



**Proposed  
Farm Locations  
for 4500 MW plus**

# Existing Generation Assumptions

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- ❑ Generation is typically dispatched in merit order (based on an economic order lists<sup>1</sup> for the ITCT and METC systems)
  - Generation on ITCT system feeding load on ITCT system
  - Generation on METC system feeding load on METC system
  - Additional generation external to ITCT is required to serve all load within the ITCT footprint (typically units within the METC footprint utilized)

1 Generation in the ITCT and METC footprints was dispatched in economic merit order to the best of ITC's ability. ITC does not have a current merit order listing.

# Future Generation Assumptions

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- 3/4 of the new resources were dispatched against generation external<sup>2</sup> to MECS and 1/4 of the new resources were dispatched against generators within the MECS<sup>1</sup> footprint
- When attempting to export large amounts of power out of Michigan there would most likely be limits on neighboring systems including but not limited to ATC, First Energy, AEP, NIPSCO, Detroit Edison, and Consumers Energy.

1 Generation in the MECS footprint was dispatched in economic merit order to the best of ITC's ability. ITC does not have a current merit order listing.

# Future Generation Assumptions

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- ❑ Wind was dispatched:
  - 15% of nameplate capability @ peak
  - 100% of nameplate capability @ 80% peak
- ❑ Per the MI-WETS Working Group, Michigan average wind production was modeled to total only 15% of nameplate capability during the time of peak system loading.
  - The projects identified for this study would not ensure that all of the wind farms would be able to operate simultaneously at their nameplate capability.

# Other Key Assumptions

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- Total Combined ITCT and METC peak load (plus losses) of approximately 24,400 MW
  - METC ~11,950
  - ITCT ~ 12,450
- Approximately 2018 timeframe
  - Based on forecasts available at the start of this study
  - Corresponds with 2010-2011 from 21<sup>st</sup> Century Plan base forecast for combined ITCT and METC load)

# Preliminary Results

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- ❑ Significant transmission upgrades required to support large amounts of wind in the Thumb area
  - Amount of future wind in the Thumb will dictate voltage level required for upgrades (i.e. 120 kV vs. 230 kV vs. 345 kV)
- ❑ In order to export large amounts of power from Michigan, stronger interconnections to the south would be required
- ❑ Large amounts of generation in Northern Michigan may require stronger (or controllable) interconnections with ATC to the north
- ❑ Coordination would be required with neighboring utilities



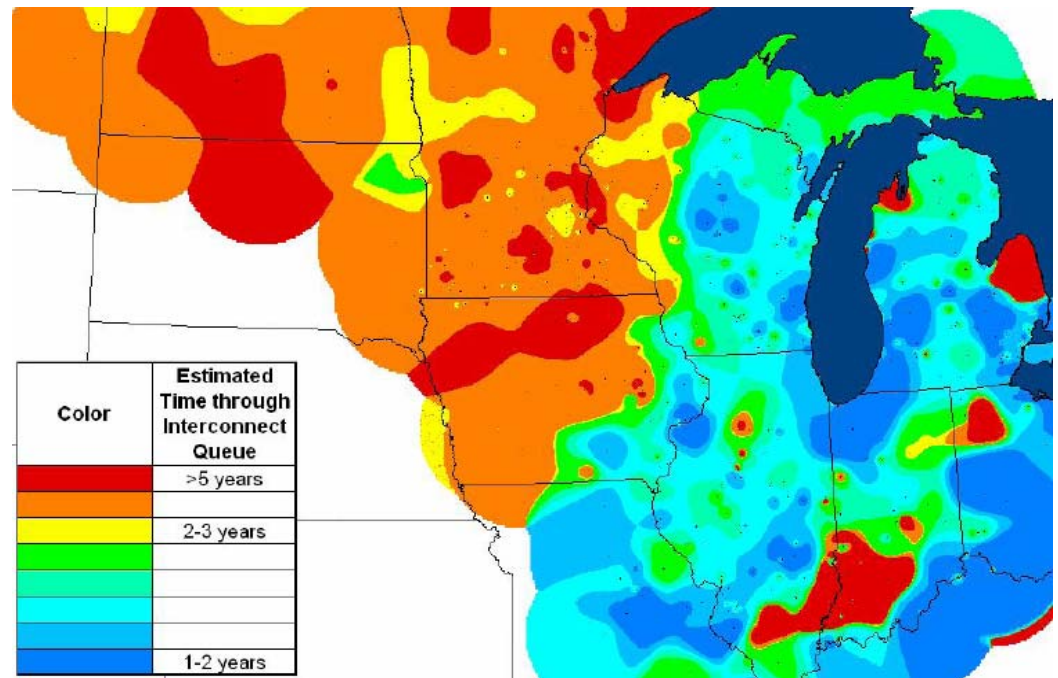
# Next Steps for Lower Peninsula Study

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- ❑ Finalize study results and develop rough estimates of MECS Transmission expansion costs for 5500 MW wind scenario by mid November.
- ❑ Develop ITC report by early December.
- ❑ Incorporate into MPSC Staff MREP report in early 2009.
- ❑ Reconvene MI-WETS working group to determine good wind zones to be studied in more detail in 2009.

# Roadblocks in MISO Interconnection Queue Process

- This map is meant to give a high level estimate of the approximate time it may take to move through the MISO Generation Interconnection process based on the projected amount of first contingency incremental injection capability considering existing and proposed generation in a geographic area.
- This map considers only study timeline, not permitting or construction timelines.
- This map should not be treated as a substitute for studies.



# MI-WETS for the Upper Peninsula

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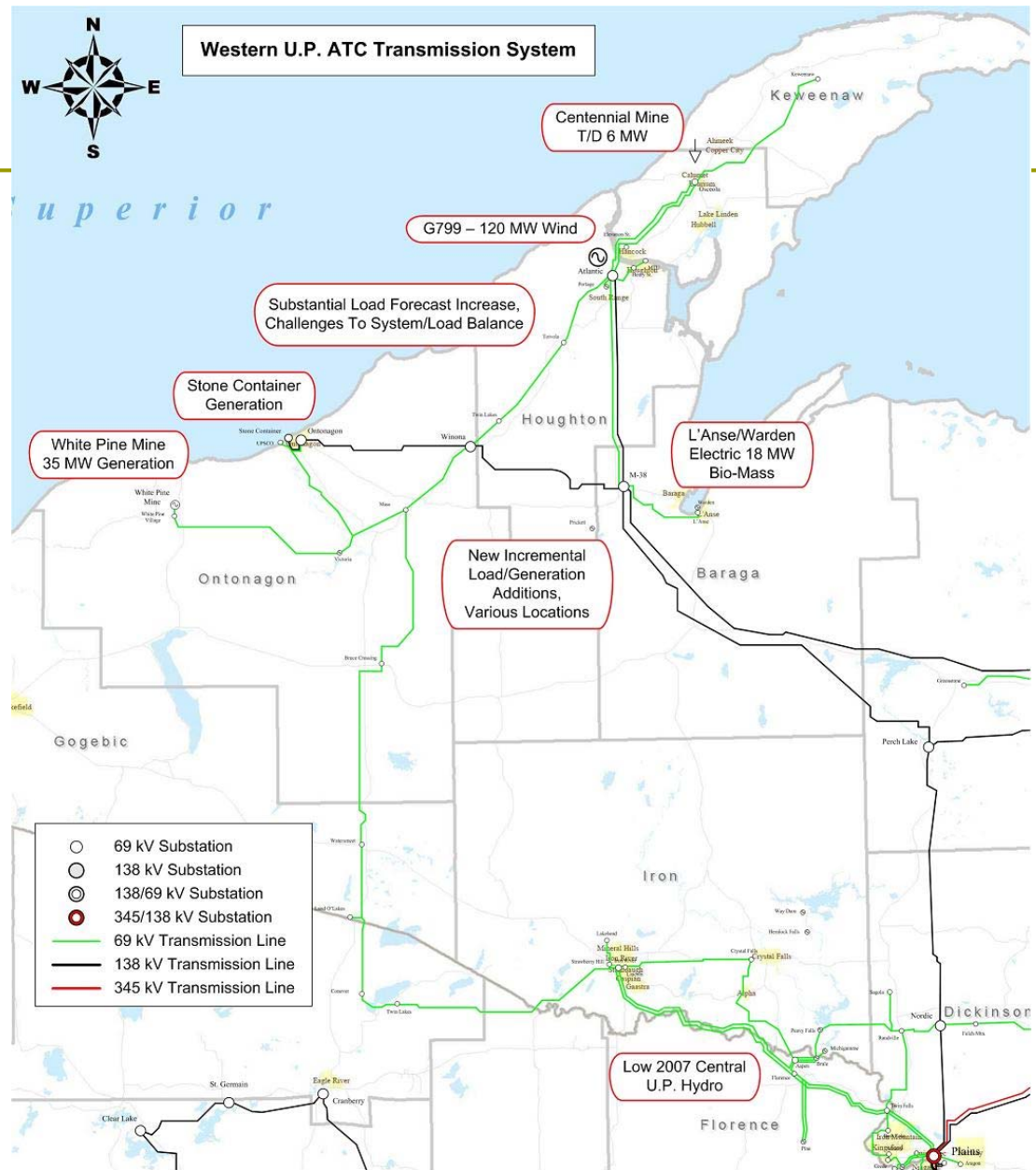
- ❑ Approach is to examine existing generation interconnection studies
  - Look for general issues in the studies
  - Can generation interconnection projects also solve other UP needs?
- ❑ Six studies for five locations in the UP have been published
  - Three are for wind generation in the 100 to 200 MW range
- ❑ Three are for non-wind, but provide useful information overview of system issues

# Overview of UP Transmission Sub-Regions

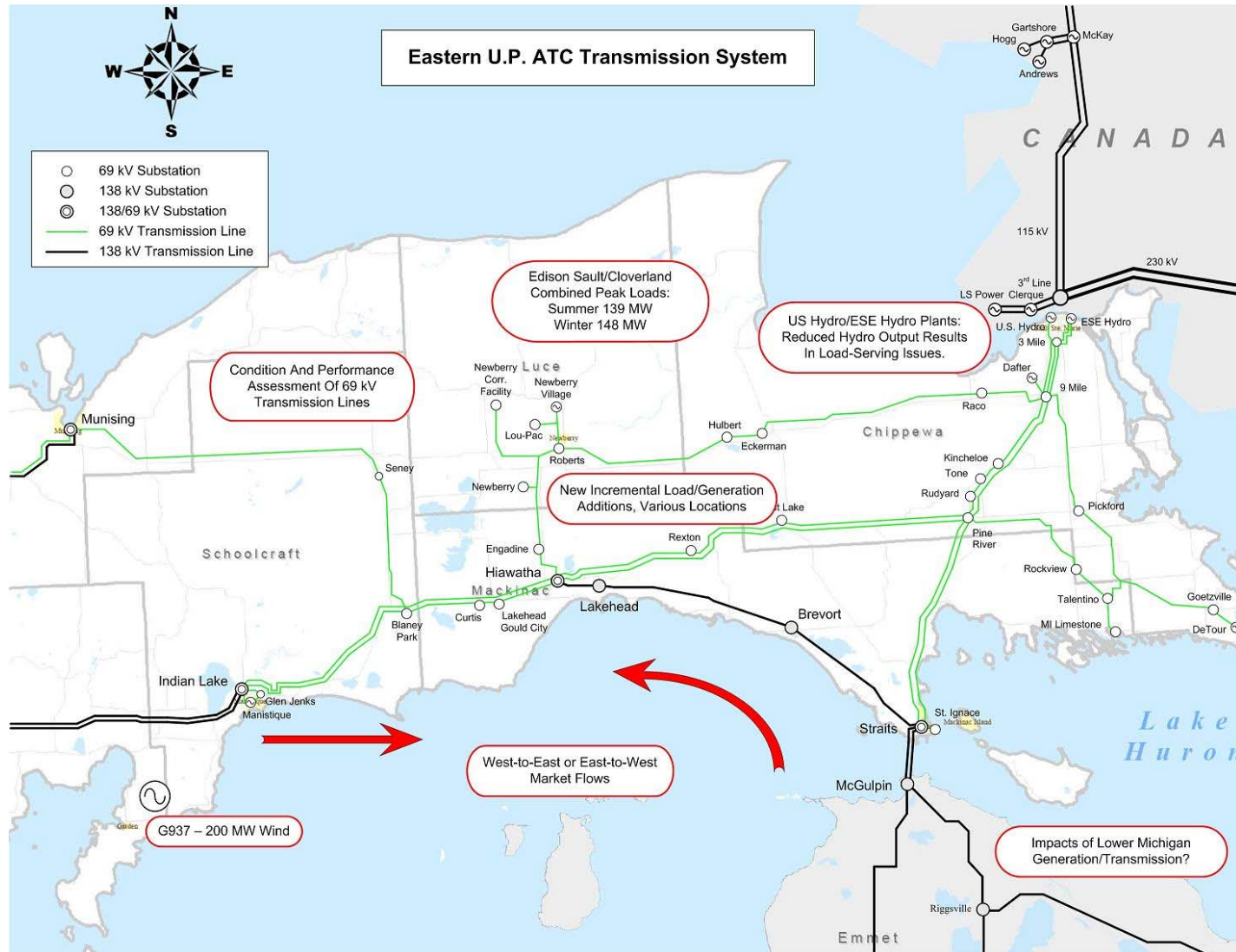
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- ❑ In ATC's current work on the UP, West, Central and East study areas are identified
- ❑ East and West areas are somewhat similar
  - Rely heavily on traditional 69kV networks
  - Existing generation hosted in these areas is smaller than 100MW per site
- ❑ Public information about interconnection studies resides on the MISO website at <http://www.midwestiso.org/page/Generator+Interconnection>. There, see *Generator Interconnection Queue Projects* and search the *GI Interactive Queue* (database)

# Western UP Overview



# Eastern UP Overview



# Studies in the East and West

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## □ West

### ■ G583

- 16MW Ontonagon County
- White Pine Substation

### ■ G799

- 120.45MW Houghton County
- Atlantic Substation

## □ East

- No studies to date
- G799 is at the border of the East area
  - Electrically part of the Central Area



# Study Findings – East and West Areas

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- ❑ Commercial scale wind projects are much larger than current generation resources in the East and West UP
- ❑ Large scale generation projects cause the transmission system to exceed multiple limitations
  - Even the 16MW project required several system upgrades
- ❑ The UP system could host wind generation with the appropriate upgrades

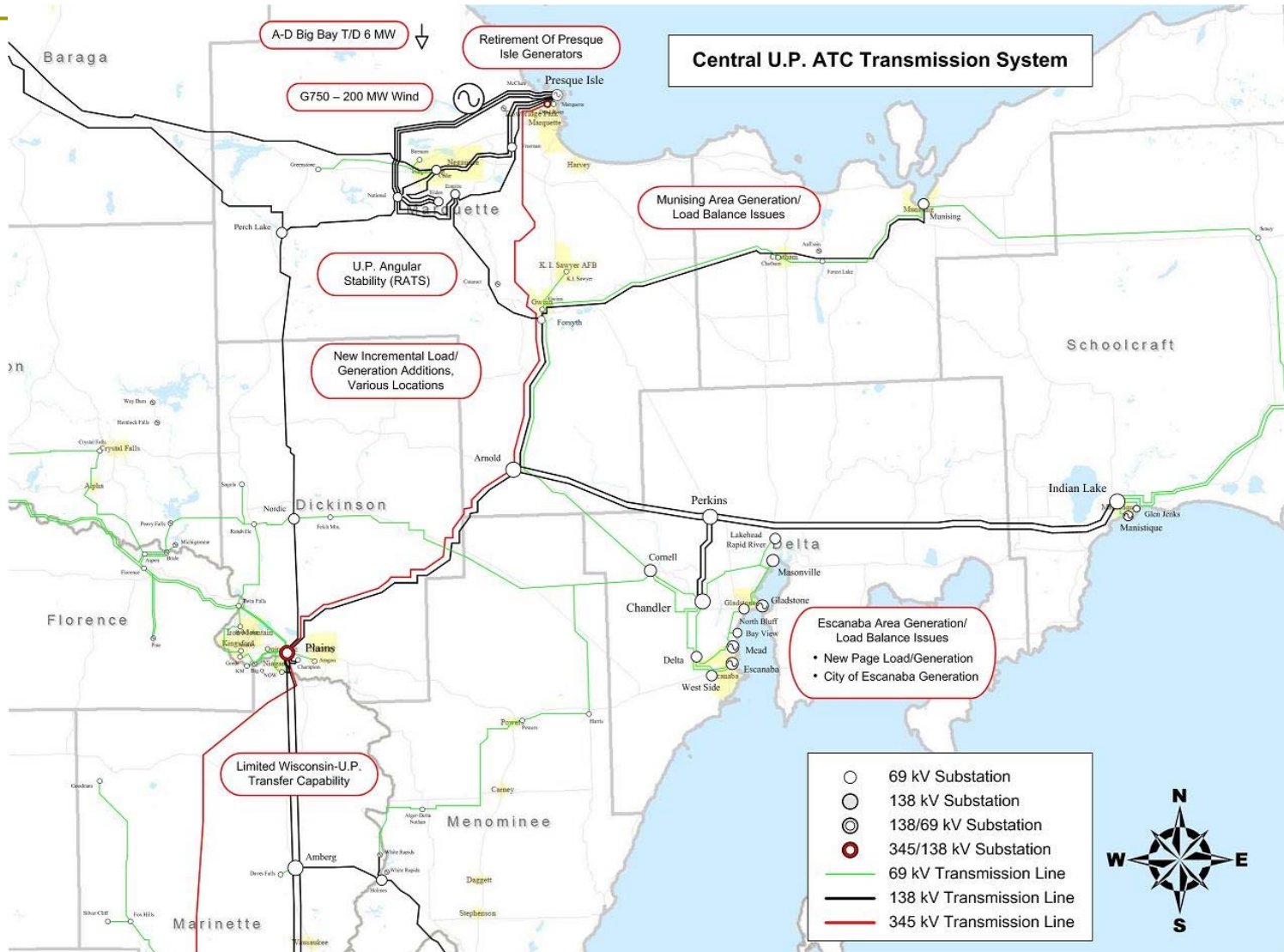


# Overview of the Central UP Transmission Sub-Region

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- The Central UP hosts much larger loads and generators than the East and West
- Large loads (mines, paper and forest products mills, or municipal utilities) have historically provided their own generation at the load site.
- Transmission consists of a single 345kV line, with a network of 138kV lines underlying it.
  - The system is currently at its limit for importing and exporting power

# Central UP Overview



# Studies in the Central area

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## □ Central

### ■ G567 and G568

- 165 MW and 135 MW (300 MW Total)
- Delta County
- Escanaba Substation

### ■ G750

- 201MW, Marquette County
- Lines 446 and 447

### ■ G937

- 200MW, Delta County
- Indian Lake – Perkins 138kV Lines

# Study Findings – Central Area

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- Each of the Central area studies showed the need for significant transmission upgrades to host the proposed generators.
- New generation proposals compete with the existing generation and loads for scarce import and export capacity
- The Central UP system could also host wind generation with the appropriate upgrades

# UP Wind Projects

## Overall Observations

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- ❑ The traditional reliability of the UP transmission system relies on a balance of load, generation and transmission
- ❑ Commercial scale wind projects are much larger than current generation resources in the East and West UP
- ❑ The Central UP transmission system lacks the additional margin to host new large scale generation without significant system upgrades

# Next Steps

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- ❑ ATC is currently working on its ATC Energy Collaborative – Michigan
  - a study of the overall UP needs for 2013, 2018, and 2024
- ❑ Wind is one several drivers for planning the transmission system
- ❑ ATC is looking for transmission projects which will best fulfill multiple needs
  - Generation Interconnection
  - Load serving
  - Market Access

# Questions & discussion...

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- For more information or to participate in ongoing Michigan transmission studies, see:

*Michigan Planning Consortium*

and *Wind Studies* webpages at

[http://www.michigan.gov/mpsc/0,1607,7-159-16377\\_47107---,00.html](http://www.michigan.gov/mpsc/0,1607,7-159-16377_47107---,00.html)

(MPSC Website – <http://www.mi.gov/mpsc> – click on *Electricity*, then *Workgroups*)